

What is claimed is:

1. A method of data mining attributes for monitoring and controlling a process, comprising:

- 5 a. collecting and storing process attribute information in a plurality of databases;
- b. receiving at least one process measurement from a measurement device;
- c. similarity searching the at least one process measurement against the process attribute information stored in the databases;
- d. assigning a similarity score to the process measurement;
- 10 e. comparing the similarity score to a match tolerance level;
- f. computing a process action for at least one process machine via an algorithm having a process variable, comprising:
 - 15 (i.) replacing the process variable in the algorithm with the process measurement where the similarity score is equal to or greater than the match tolerance level;
 - (ii.) replacing the process variable in the algorithm with a set point where the similarity score is lower than the match tolerance level; and
- g. communicating the process action to a process machine.

- 20 2. The method of claim 1, wherein the process attribute information comprises at least one data type, chosen from a group consisting of process machine type, process machine performance ranges, process machine conditions, process set points, and past process measurements.

3. The method of claim 1, wherein the at least one databases reside on a process controller.

4. The method of claim 1, wherein the at least one databases communicate with a process controller, via a network.

5. The method of claim 4, wherein the network is chosen from a group consisting of local area networks, wide area networks, global communication networks, intranet, and Ethernet.

6. The method of claim 1, wherein the measurement device further comprises a process sensor.

7. The method of claim 1, wherein the process measurement is received from the measurement device, via an input/output device.

8. The method of claim 1, wherein the step of similarity searching is performed via a similarity search engine.

9. The method of claim 8, wherein the similarity search engine resides on a process controller.

10. The method of claim 8, wherein the similarity search engine communicates with the process controller via a network.

11. The method of claim 10, wherein the network is chosen from a group consisting of local area networks, wide area networks, global communication networks, intranet, and Ethernet.

5 12. The method of claim 1, wherein the similarity search score is assigned via a process controller.

13. The method of claim 1, wherein the process action is computed via a process controller.

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14. The method of claim 1, wherein the process action is communicated via a process controller.

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15. A software program embodied on a computer-readable medium incorporating the method of claim 1.

16. The method of claim 1, wherein:

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- a. the match tolerance level of the process attribute information comprises numeric representations;
- b. the numeric representations are sorted in descending; and
- c. replacing the process variable in the algorithm with the attribute having the highest numeric representation of match tolerance level.

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17. The method of claim 2, wherein the process machine type is selected from the group consisting of rotating machines, heat exchangers, valves, and transmitters.

18. A computer-implemented method for monitoring and controlling a process, comprising:

- a. collecting and storing process attribute information in a plurality of databases;
- 5 b. receiving at least one process measurement from a measurement device onto a process controller via an input/output device;
- c. similarity searching the at least one process measurement against the process attribute information stored in the databases via a similarity search engine;
- d. assigning a similarity score to the process measurement via the process controller;
- 10 e. comparing the similarity score to a match tolerance level;
- f. the process controller computing a process action for at least one process machine via an algorithm having a process variable, comprising:
 - 15 i. replacing the process variable in the algorithm with the process measurement where the similarity score is equal to or greater than the match tolerance level;
 - ii. replacing the process variable in the algorithm with a set point where the similarity score is lower than the match tolerance level; and
- 20 g. the process controller communicating the process action to a process machine via an input/output device.

19. The method of claim 18, wherein the process attribute information comprises at least one data type, chosen from a group consisting of process machine type, process machine performance ranges, process machine conditions, process set points, and
25 past process measurements.

20. The method of claim 18, wherein the at least one databases reside on the process controller.

5 21. The method of claim 18, wherein the at least one databases communicate with the process controller, via a network.

10 22. The method of claim 21, wherein the network is chosen from a group consisting of local area networks, wide area networks, global communication networks, intranet, and Ethernet.

23. The method of claim 18, wherein the measurement device further comprises a process sensor.

15 24. The method of claim 18, wherein the similarity search engine resides on the process controller.

25. The method of claim 18, wherein the similarity search engine communicates with the process controller via a network.

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26. The method of claim 25, wherein the network is chosen from a group consisting of local area networks, wide area networks, global communication networks, intranet, and Ethernet.

27. A software program embodied on a computer-readable medium incorporating the method of claim 18.

28. The method of claim 18, further comprising notifying an operator where the similarity score is lower than the match tolerance level to identify the process variable.

29. The method of claim 19, wherein the process machine type is selected from the group consisting of rotating machines, heat exchangers, valves, and transmitters.

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30. The method of claim 18, further comprising predicting failure of a process machine by comparing the similarity score to the match tolerance level of process measurements from the machine.

31. The method of claim 18, further comprising determining a failure mode of a process machine by comparing the similarity score to the match tolerance level of process measurements from the machine.

32. A system for monitoring and controlling a process, comprising:
a plurality of databases for storing process attribute information;
a means for receiving a process measurement from a measurement device;
a similarity search engine for similarity searching the measurement against the process attribute information collected and stored in the databases;
a means for assigning a similarity search score to the measurement;
a means for comparing the similarity search score to a match tolerance level;

a process controller for computing a process action via an algorithm having a process variable; and
a means for communicating the process action to a process machine.

5 33. The system of claim 32, further comprising:

replacing the process variable in the algorithm with the process measurement where the similarity score is equal to or greater than the match tolerance level;
replacing the process variable in the algorithm with a set point where the similarity score is lower than the match tolerance level; and
10 notifying an operator where the similarity score is lower than the match tolerance level.

34. The system of claim 32, further comprising:

replacing the process variable in the algorithm with the process measurement where
15 the similarity score is equal to or greater than the match tolerance level;
replacing the process variable in the algorithm with a process attribute having the highest match tolerance level where the similarity score is lower than the match tolerance level; and
notifying an operator where the similarity score is lower than the match tolerance
20 level.

35. The system of claim 32, further comprising means for numerically representing the process attribute information and means for storing the numeric representations in a predetermined sequence to facilitate similarity searching.

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36. A method for identifying an unidentified object having at least one process attribute, comprising:

collecting information about at least one process attribute of the unidentified object;

converting the collected attribute information into a language independent format;

5 arranging the collected information in language independent format in a predetermined sequence;

comparing the language independent collected attribute information with information related to a plurality of known objects, wherein the known objects may include a different number and type of attributes than the unidentified object;

10 assigning a value to each of the known objects that indicate the degree of similarity each known object has to the unidentified object;

providing a list of known objects most closely matching the unknown object based on the assigned similarity values; and

15 replacing the attribute of the unidentified object with the known object of highest similarity.

37. A method of data mining objects having attributes for one or more process control loops, comprising:

20 collecting information about at least one process attribute from a process variable database;

converting the collected attribute information into a language independent format;

arranging the language independent collected information in a predetermined sequence;

25 comparing the language independent collected attribute information with information related to a plurality of known objects, wherein the known objects may include

different numbers and types of attributes than the collected process attribute information;

assigning a similarity value to each of the known objects for indicating the degree of similarity each object has to the collected process variable attribute; and

5 providing a list of the known objects that most closely match the object having the collected attribute based on the similarity value.

38. The method of claim 37, wherein the collected process attribute information relates to a process machine.

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39. The method of claim 37, further comprising replacing the objects having collected process attribute information of with the known objects of highest similarity values.